

Curcuma longa L.

Zingiberaceae

Marina Silalahi

Synonyms

Amomum curcuma Jacq. (1776); *Curcuma domestica* Val. (1918)

Local Names

Brunai: kunyit, temu kuning, temu kunyit. **Cambodia:** ramat, rameut, ra miet. **Laos:** khi min, khmin khun. **Indonesia:** kunyit (general), bangle (Lembak), hunik (Batak Toba), huni (Moyo Island), koneng (Sundanese), kuni (Sanger), kunir (Javanese), kuning gersing (Batak Karo), kuning (Halmahera), unik (Pasaman). **Malaysia:** kunyit, temu kunyit, tius. **Papua New Guinea:** lavar, tamaravirua. **Philippines:** dilaw (Tagalog), dluya thembaga (Lapuyan), duyaw (Surigao), kalabaga (Bisaya), kalawag (Guimaras), kunik (Ibanag). **Thailand:** khamin (general), ka min, khamin kaeng (Northeastern), khamin chan (Central). **Vietnam:** nghệ vàng (general), mìn đăm (North Vietnam), ngh[eej], ngh[eej] v[af]ng,uaas] kim, nghe, ba (Center Vietnam). **English:** turmeric (Chassagne et al. 2016; Des et al. 2018; Gruyal et al. 2014; Junsongduang et al. 2017; Kasrina et al. 2019; Luh-Dam et al. 2016; Minh et al. 2014; Ong and Kim 2014; Pandiangan et al. 2019; Pizon et al. 2016; Silalahi et al. 2018; Trimanto et al. 2019; Wahkidah et al. 2017; Wardini and Prakoso 1999).

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Botany and Ecology

Description: Robust, perennial, erect, strongly tillering herb (often cultivated as annual) up to 1 (–1.5) m tall. Rhizome a fleshy complex ellipsoidal primary tuber (about 5 cm × 2.5 cm) at base of each aerial stem, ringed with the base of old scale leaves and when mature bearing numerous straight or slightly curved, cylindrical, lateral rhizomes (called finger), 5–10 cm × 1–1.5 cm, which are again repeatedly branch more or less a right angles, the whole forming a dense clumps. Rhizomes inside and outside bright orange, young tip white, with a spicy smell when bruised. Roots filiform, tough, sometimes very long, often swollen into ellipsoidal tuber at apex (2–4 cm × 1–2 cm). Leaf sheaths up to 65 cm long, blades oblong-lanceolate to ovate-lanceolate, 7 × 70 cm × 3–20 cm, densely studded with pellucid dots. Inflorescence terminal on a leafy shoot, bracts pale green with white streaks or white margins, coma bracts white, sometimes pink-tipped. Corolla 4.5–5.5 cm long, white. Labellum suborbicular to obovate, 12–22 mm in diameter, white with yellow median band, other staminodes longitudinally folded, creamy white, anther with large spur (Dahal and Idris 1999; Wardini and Prakoso 1999) (Fig. 1).

Distribution and Habitat: *C. longa* is found naturalized mainly in teak forest but also in sunny places, on clayed to sandy soils up to 2000 m altitude. It can be cultivated in most area of the tropics and subtropics provided rainfall is adequate (1000–2000 mm). Though turmeric is grown in various soil types, well drained, loose, and friable fertile loam or clay loam, with good organic matter status, in pH range of 5–7.5 is preferred (Dahal and Idris 1999). Only known from cultivation in Thailand, Malaysia, and Java (Wardini and Prakoso 1999).

Fig. 1 Inflorescence of *Curcuma longa* L. (Zingiberaceae), Bogor, West Java, Indonesia. (Photo © W. A. Mustaqim)



Local Medicinal Uses

Cambodia: Dry rhizome crushed with honey is eaten to treat stomachache, wound, postpartum (tonic, appetite, sleepiness), and sprains by Bunong people of Northeast region (Chassagne et al. 2016). **Indonesia:** Various ethnic groups in Indonesia use *C. longa* as a traditional medicine. The Sanger ethnic community in North Sulawesi use rhizomes and leaves to treat liver ailments, cough, and to reduce body odor (Pandiangan et al. 2019). To treat liver diseases and cough, fresh rhizome extract is mixed with honey and egg and consumed (Pandiangan and Silalahi 2020). Batak people of North Sumatra use leaves as a traditional sauna material (*oukup*), for removing body odor and to impart a relaxing effect (Silalahi and Nisyawati 2019). The Batak Phakpak use rhizomes to treat sprains, headaches, stomachache, ulcers, diabetes mellitus, wounds, and malaria (Silalahi et al. 2018). Rhizome is used to treat gastrointestinal disorders, bloating, abdominal pain, menstrual disorders, diarrhea, abdominal pain, muscle aches, and vaginal odor after menstruation by Javanese in Yogyakarta (Nahdi and Kurniawan 2019). The local people of Labuhan Ratu use rhizomes to cure stomachache and pains due to sprain (Leksikowati et al. 2019). The Sundanese in Bogor use rhizomes to increase stamina, as an ingredient of *jamu gadongan*, and in baby care. *Jamu gadongan* is a formulation made from 11 medicinal plants, one of which is *C. longa*; it is prescribed as tonic for postpartum mothers (Rahayu et al. 2019). The Brangkuah community in Moyo island pound rhizomes and consumed as an antidote for poisons (Trimanto et al. 2019). The local people in Turgo (Yogyakarta) drink fresh rhizome extract to cure liver diseases, rheumatic disorders, typhoid, and diarrhea (Nahdi et al. 2016). Kasrina et al. (2019) report that the Lembak ethnic community in Bengkulu use rhizomes as antidote. **Malaysia:** The local communities in Sabah apply a rhizome paste on the affected area as antifungal (Kulip 2003). Pounded rhizomes are applied as a paste on sprained joints; rhizome is rubbed over insect bites by local people in Sabah (Achmad and Holdsworth 2003). **Philippines:** The local communities in Guimaras Island use ground rhizomes to cure fever and burns. The poultice made from rhizomes of *C. longa* with leaves of *Leea indica* and *Zingiber officinale* leaves are used to treat dizziness and abdominal pain (Ong and Kim 2014). The ethnic groups in Mindanao drink stem and rhizome decoction as a treatment for cancer/tumor (Pucot et al. 2019). The Subanen people apply an infusion of rhizomes soaked in lukewarm water to the affected part to cure arthritis. Decoction of *C. longa* and *Kaempferia* rhizomes are used to treat goiter (Pizon et al. 2016). Preheated rhizome extract is mixed with coconut oil and used to heal bruises and boils by people in Northern Surigao (Gruyal et al. 2014). **Vietnam:** The Ba local community of central Vietnam use rhizomes to cure stomachache and cough (Minh et al. 2014).

Phytochemistry

Leaves: Leaves contain essential oil such as: α -pinene, β -pinene, sabinene, myrcene, α -phellandrene, 1,8-cineole, p-cymene, C8-aldehyde, linalool, caryophyllene, geraniol and methyl heptanone (Behura et al. 2002). Tripathi et al. (2002) reported α -pinene, β -pinene, myrcene, 1,8-cineole, γ -terpinene, p-cymene, terpinolene, linalool, p-cymene-8-ol, myrtenol, ar-turmerone, α -turmerone, and β -turmerone from the essential oil. **Rhizomes:** The rhizome extract contains flavonoids such as catechin, epicatechin, and naringenin (Alafiatayo et al. 2019). α -phellandrene, α -terpinene, p-cymene, 1,8-cineol, terpinolene, β -Caryophyllene, r-curcumin, α -zingiberene, β -bisabolene, β -sesquiphellanderene, r-turmerone and α -turmerone are reported from essential oil (Asghari et al. 2009). The n-hexane extract contain α -pinene, vinyl propionate, P-cymene, 1,8-cineole, camphor, α -terpineol, β -caryophyllene, γ -curcumene, ar-curcumene, α -zingiberene, -sesquiphellandrene, ar-turmerol, α -cadinol, ar-turmerone, α -turmerone, β -turmerone, (6R, 7R)-bisabolone and (E)- α -atlantone (Ferreira et al. 2013). Gas chromatography-mass spectrometry (GC-MS) of fresh extract yielded α -pinene, sabinene, β -pinene, myrcene, α -phellandrene, 3-carene, α -terpinene, p-cymene, limonene, 1,8-cineole, terpinolene, p-cymen-8-ol, cis- α -bergamotene, β -caryophyllene, α -santalene, trans-- α -bergamotene, epi- β -santalene, α -humulene, trans- β -farnesene, sesquisabinene, ar-curcumene, α -zingiberene, (E,E)- α -farnesene, β -bisabolene, β -sesquiphellandrene, trans- γ -bisabolene, cis-sesquisabinene hydrate, trans-nerolidol, santalenone, ar-turmerol, dihydro-ar-turmerone, ar-turmerone, α -turmerone, germacrone, β -turmerone, curcuphenol, 7R-bisabolone, and trans- α -atlantone (Singh et al. 2010).

Curcumin from rhizomes is popular for its antimicrobial activity (Lawhavinit et al. 2010). Curcumin inhibits growth of the leishmanial strains such as *Leishmania major*, *Leishmania tropica* and *Leishmania infantum* (Saleheen et al. 2002). The ethanol and hexane extracts of rhizomes inhibit growth of *Vibrio harveyi*, *Vibrio cholerae*, *Vibrio alginolyticus*, *Vibrio parahaemolyticus*, *Vibrio vulnificus*, *Aeromonas hydrophila*, *Streptococcus agalactiae*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Staphylococcus intermidis*, *Bacillus subtilis*, *Bacillus cereus*, and *Edwardsiella tarda* (Lawhavinit et al. 2010). Goel et al. (2008) reported that curcumin has therapeutic potential against diseases such as adenomatous polyposis, inflammatory bowel disease, ulcerative colitis, colon cancer, pancreatic cancer, hypercholesteremia, atherosclerosis, pancreatitis, psoriasis, and arthritis.

Local Food Uses

Indonesia. *C. longa* rhizome is one of the ingredients of *terites* (processed liquid extract of bolus liquid from cow's stomach); it is a cuisine unique to the Batak Karo of North Sumatra (Purba et al. 2018). The fresh rhizome extract is used as a natural coloring agent for rice by the Balinese in Bali island (Putri et al. 2014), the Pasaman people in Sumatra (Des et al. 2018), and elsewhere.

Biocultural Importance

Indonesia. *C. longa* is widely used in a variety of traditional health dishes and drinks by local communities of Indonesia. *Jamu kunir asam* (*jamu* = fresh traditional concoction drinks; *kunir* = tumeric; *asam* = tamarind) is a Javanese heritage herbal medicine used to maintain stamina and to treat a variety of diseases (Nahdi and Kurniawan 2019; Sumarni et al. 2019). **Vietnam:** In North Vietnam, *C. longa* is used as food coloring agent in steamed sticky rice dishes (Luh-Dam et al. 2016).

Economic Importance

Thailand: Local people in Northeastern Thailand extract a yellow dye from rhizomes for use in the cotton and silk textile industry (Junsongduang et al. 2017). **Vietnam:** In North Vietnam, *C. longa* is used as to extract dyes for dyeing threads and fibers (Luh-Dam et al. 2016).

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